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ABSTRACT

Because the Brookover Self-Concept of Ability Scale has been widely used during the past decade as an index of general academic self-concept, this scale was selected to investigate the hypotheses in the present study. The purpose of this study were twofold: (1) to investigate the dimensionality of academic self-concept through patterns of item intercorrelation and factor analysis; and (2) to explore the relationship among the resultant academic self-concept factors, school achievement and I. Q. One hundred and thirty-four seventh grade students served as subjects. The principal factors method of factor analysis was used. Resulting data supported the set of hypotheses under investigation. The results of this study suggest that examination and reporting of the Brookover Scale as three subscales could serve to strengthen the interpretation of that variation in school achievement attributable to general academic seld-concept. To the extent that academic self-concept is an affective consequence of the teaching-learning process and is an inhibitor of school achievement, the implications for education concerning multiple factors in the ASC construct are numerous. (Author/PC)

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ACADEMIC SELF CONCEPT AND SCHOOL ACHIEVEMENT:

A MULTIPLE PROBE

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Academic Self-Concept and School Achievement: A Multiple Probe

Introduction

Most research investigating factors associated with school achievement has demonstrated a relationship between the learner's perception of his academic ability and his level of academic performance. The magnitude of the correlation generally approaches .50; and, with an underlying ability factor controlled, this association approximates .35 (Bloom, 1971).

The data suggest that twenty-five percent of the variation in school achievement is attributable to general academic self-concept (ASC). Considering this variation to be representative of student characteristics that might be shaped during the schooling process, educators have attempted to promote learning conditions conducive to the positive development of student ASC. In the shuffle of arranging these conditions, the construct of academic self-concept seems to have been somewhat reified. That is, the self-concept variable has been most frequently described in terms of a single summated score derived from a unidimensional scale. Perhaps there are additional relevant dimensions indigenous to the ASC construct which not only are concealed by a single score, but also are potential sources of information to be used in describing the ASC-school achievement relationship. One purpose of this study is to investigate the dimensionality of academic self-concept through patterns of item intercorrelation and factor analysis.

Brookover (1964) selected the context of the school environment to conceptualize the general academic self-concept as a threshold variable limiting achievement. The ASC construct tapped in an educational setting is usually reflected by a scale assessing a relative judgement: the student's

perception of his academic ability in relation to the achievement of his classmates (Brookover, 1964). Therefore, as a norm-referenced perception, the student's general ASC is based upon the feedback he receives from his teachers, parents, peers, and grades regarding the adaquacy of his school work (Brookover, 1964; Bloom, 1970). Because the Brookover Self-Concept of Ability Scale has been widely used during the past decade as an index of general academic self-concept (Brookover, 1964; Linton, 1972; House and Moore, 1974) this scale was selected to investigate the hypotheses in the present study.

A second purpose of this study is to explore the relationship among the resultant academic self-concept factors, school achievement and IQ. In addition, this relationship is investigated when IQ, race, and sex are statistically controlled.

Longtitudinal research has indicated that academic self-concept tends to vary over time (Brim, 1954; Brookover, Thomas, and Patterson, 1964). Changes toward a more positive ASC were found to correspond to increases in school achievement even when intelligence was controlled. Kifer (1973) demonstrated that school achievement has a cumulative effect on academic self-concept and proposed that this trend might be an affective consequence of the school learning process. Research investigating the strength of the relationship between academic self-concept and school achievement has indicated a higher correlation between ASC and school grades than between ASC and scores on standardized achievement tests (Ryan and Klemmack, 1968; Torshen, 1969). To further delineate this relationship, Ryan and Klemmack (1968) controlled for existing proficiency in a subject area. Hence, that student perceptions of academic abilities appear to be more closely associated with

teacher evaluations of scholastic performance than with standardized measures of achievement, the norm-referenced ASC construct described by Brookover (1964) is corroborated.

Sample, Variables, and Procedures

From seventh grade students at one middle school, 134 students, stratified with respect to race and sex, were randomly selected. The variables of interest in this study are as follows: a) academic self-concept, which refers to the student's perceptions of his general ability for scholastic achievement as measured by a 12-item Brookover Scale (r_{tt}= .72); b) school achievement, which refers to the raw scores on the language arts and non-verbal subtests of the Comprehensive Test of Basic Skills (CTBS) and to the school grades (GPA) received during two consecutive nine-week quarters; c) IQ, which refers to the score obtained from the verbal subtest of the Lorge Thorndike Intelligence Test.

H_1: The construct of general academic self-concept as measured by the Brookover Self-Concept of Ability Scale yields factor loadings on more than one structure in a factor analysis.

To investigate this hypothesis the principal factors method of factor analysis was used. The factor axes were rotated orthogonally in order to maintain independence of the factors. If multiple factors were indicated, subscores were to be calculated by summing the item responses for each factor.

H_2: There is a significant relationship among the structures of academic self-concept (as determined by a factor analysis of the BSCA Scale) and the school achievement variables.

H_3: There is a significant relationship among the structures of academic self-concept and the school achievement variables when IQ, race, and sex are statistically controlled.

To investigate the second and third hypotheses stepwise multiple regression procedures were performed. For H_2 the dependent variables in the regression analysis were GPA, the CTBS subtests, and IQ. In order to investigate the relationship of the BSCA factors and the various types of school achievement independent of IQ, race, and sex, these three variables were entered first into the stepwise procedure.

Results

A factor analysis of the Brookover Scale indicated three major rotated factors (a varimax rotation), each possessing eigenvalues greater than one. These rotated structures are found in Table 1. The items in the Brookover Scale corresponding with the factor structure are found in Table 2.

The first factor (T1) includes five questions, each of which seem to elicit a relative assessment of school ability from the student. These items ask the student to compare his school ability with that of his reference group and to rank himself accordingly.

Factor two (T2) is composed of two items reflecting a general academic self-concept that appears to be a perception independent of the reference group to which a student belongs. This ASC structure is perhaps somewhat "absolute" in nature because these items do not seem to be based on the students perceptions of the present judgements of significant others.

The third factor (T3) includes three questions that could be designated as attempts to tap the importance the student attaches to his school work. As such, these items appear to assess this importance of schoolwork in relation to the grades the student receives.

Hence, these three major factors indicate that the Brookover Scale is more explicitly a composite of three inter-related structures, rather than simply a measure of a unidimensional construct of general academic self-concept. These three structures also indicate that future work in the area of academic self-concept might incorporate the distinctive components of the ASC construct as revealed by factor analysis into the investigation. One such investigation is currently in progress at the University of South Carolina.[1]

In order to investigate the relationship between these three ASC factors and the school achievement variables, a stepwise multiple regression procedure was performed. The results of this procedure are found in Table 3.

With GPA as the dependent variable, the multiple coefficient of determination (R^2) for T2 was found to be .20 ($p<.0001$). The single factor T2 accounted for approximately twenty percent of the GPA variation; neither of the remaining factors increased the multiple R^2 significantly.

On the language arts subtest of the CTBS, $R^2=.17$ ($p<.0001$) for T_3. When T2 was combined with T3 approximately twenty percent of the variation in the CTBS verbal subtest was expained. This increase in the R^2 was significant.

On the non-verbal subtest of the CTBS, T_2 again is entered first into the regression analysis and found to account for twenty percent of the variance. No other BSCA factor variables increased the R^2 by a significant amount.

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[1] Among several tentative findings, Anderson and Scott demonstrated that given a general ASC scale containing three 5-item factors ($r_{kk}=.92$), similar to those mentioned above, a discriminant analysis indicates that the ASC measure can increase the probability of correctly identifying the appropriate ability group to which students are assigned within their schools.

When IQ was entered as the dependent variable, T3 was the first step in the analysis (R^2= .09, p< .001). T2 in conjunction with T3 was found to yield an R^2= .14, which accounted for a significant increase in the variation. The combination of T1, T2, and T3 increased the R^2 significantly (R^2= .17, p< .03).

It is interesting to note that T2, the structure which appears to represent the student's perception of his school ability beyond that of his reference group, is the single most influential factor predicting GPA and nonverbal achievement test scores. In addition, T2 significantly contributes to the prediction of language achievement and IQ. T3, the factor reflecting the importance the student attaches to his schoolwork, is the single best predictor of language achievement and IQ. Lastly, T1 contributes little to the prediction of any of the dependent variables beyond the predictive power of T2 and/or T3.

A stepwise multiple regression procedure was used to examine the relationship between the ASC structures and school achievement when the variation in school achievement accounted for by IQ, race, and sex is statistically controlled. The results of this regression analysis are found in Table 4.

On GPA, the multiple R^2 for IQ, race, and sex was found to be .40 (p< .0001). The combination of T1 (the factor reflecting the student's norm-referenced perception of his academic ability) with IQ, race, and sex, increased the R^2 significantly. (R^2= .52, p< .0001). This eleven percent increase in the amount of variation accounted for by T1 suggests that this structure functions in the ASC construct as a perception dependent upon the student's reference group. T2 and T3 do not account for additional variation in GPA which tends to indicate that these factors are more closely linked with that GPA variation attributable to the effects of IQ, race, and sex.

With the verbal CTBS subtest, approximately fifty-six percent of the variation was accounted for by IQ, race, and sex. When T1 is entered into the regression analysis there is a significant increase of .024 in the multiple R^2 ($p<.01$). Given that the correlation between IQ and standardized achievement tests is approximately .84, this increase in the variation associated with T1 lends further support to the notion that T1 is a non-intellectual variable.

On the non-verbal CTBS subtest, IQ, race, and sex explain forty percent of the variation. When T2 is combined with these variables the R^2 increases to .53 ($p< .0001$). T1 and T3 are not entered into the analysis.

It is interesting to note that T3 does not contribute to the variation in any of the school achievement variables beyond that of IQ, race, sex, T1, and T2. This suggests that the dimension representing the importance the student attaches to his school work is more closely associated with student intellectual characteristics than the other components of the ASC construct. This finding is also supported by the results of the multiple regression procedure used to investigate the second hypothesis.

As a final check on the relationship between the ASC structures and school achievement when IQ, race, and sex are held constant, the total Brookover score (TT) was used in addition to the subscale scores in a stepwise multiple regression procedure. On GPA, the multiple R^2 for IQ, race, and sex was found to be .40 ($p< .0001$). A significant thirteen percent increase in the multiple R^2 was found when TT is combined with IQ, race, and sex. ($R^2= .53$, $p< .0001$). None of the subscale scores is

entered in the regression analysis. This finding suggests that the total Brookover Scale behaves in a manner that is similar to five items in T1. The slight increase in the GPA variation explained by TT (.13) beyond that variation accounted for by T1 (.11) appears to reflect the differences between the reliability of a 12-item test and the reliability of a 5-item test. This increase, then, appears to be largely a function of test length.

When each of the CTBS subtests were used as dependent variables, the results were identical to the findings that supported the third hypothesis. The total scale added nothing to the prediction of the CTBS subscores beyond that possible with the respective relevant self-concept factors. Hence, T1 and T2 appear to be factors common to the ASC construct in the Brookover Scale but unique with respect to the information they yield.

Conclusions and Implications

The hypotheses under investigation in this study were supported by the data. The Brookover Scale exhibits three major structures that appear to be functional components of the ASC construct. Variation in school achievement can be accounted for by one or more of the factors integral to the ASC construct beyond the powerful influence of IQ, sex and race.

The results of this study suggest that examination and reporting of the Brookover Scale as three subscales could serve to strengthen the intrepretation of that variation in school achievement attributable to general academic self-concept. Although there are only a few items loading on each factor and the intrepretation of these subscales is conceptually simplistic, it may be that useful information is lost by summing across multiple structures relevant to the ASC construct. Hence, educators may want to investigate dimensions of general academic self-concept in addition to those anchored in a

norm-referenced perception for possible factors affecting poor school achievement. Perhaps the variation in school achievement demonstrated by academic self-concept is the student's perception of his potential for academic success relative to the importance he attaches to his schoolwork. Or, perhaps the student's perception of his academic ability independent of his reference group, but with respect to the grades he receives, is the influential component in the ASC-school achievement relationship.

To the extent that academic self-concept is an affective consequence of the teaching-learning process and is an inhibitor of school achievement, the implications for education concerning multiple factors in the ASC construct are numerous. Future research investigating the inter-related dimensions of academic self-concept is necessary in order to further delineate the nature of the ASC construct and to determine if these factors appear more as a function of maturation, than as a function of the non-academic effects of schooling.

TABLE 1

BSCA Factors (Orthogonally Rotated)

Item Number		Factor I	Factor II	Factor III
(1)		0.6765	-0.1395	0.0597
(2)		0.6531	-0.1088	-0.0615
(3)	T_1	0.5401	-0.3173	-0.0494
(4)		0.6839	-0.1885	-0.0132
(5)		0.5859	-0.4659	-0.2655
(6)		-0.1346	0.6824	0.0111
(7)	T_2	-0.1838	0.6290	-0.0276
(8)		-0.3967	-0.2734	-0.2977
(9)		0.1848	-0.0675	-0.3113
(10)		-0.0191	0.0678	-0.5477
(11)	T_3	0.0416	-0.0277	-0.5485
(12)		0.0474	-0.0199	-0.5482

Table 2

Subscales determined by the
BSCA rotated factors

Factor I (T_1)

1. How do you rate yourself in school ability compared with your close friends?

   a. I am the best
   b. I am above average
   c. I am average
   d. I am below average

2. How do you rate yourself in school ability compared with those in your class in school?

   a. I am among the best
   b. I am above average
   c. I am average
   d. I am below average
   e. I am among the poorest

3. Where do you think you would rank in your class in high school?

   a. among the best
   b. above average
   c. average
   d. below average
   e. among the poorest

4. Where do you think you would rank in your class in college?

   a. among the best
   b. above average
   c. average
   d. below average
   e. among the poorest

5. Forget for a moment how others grade your work. In your opinion how good do you think your work is?

   a. my work is excellent
   b. my work is good
   c. my work is average
   d. my work is below average
   e. my work is much below average

TABLE 2 (con'd.)

Factor II (T_2)

6. Do you think you have the ability to complete college?

   a. Yes, definitely
   b. Yes, probably
   c. Not sure either way
   d. Probably not
   e. No

7. What kind of grades do you think you are capable of getting?

   a. mostly A's
   b. mostly B's
   c. mostly C's
   d. mostly D's
   e. mostly E's

Factor III (T_3)

8. How important to you are the grades you get in school?

   a. very important
   b. important
   c. not particularly important
   d. grades don't matter to me at all

9. How important to you are good grades compared with other aspects of school?

   a. good grades are the most important thing in school
   b. good grades are among the most important things in school
   c. some other things in school are more important than good grades
   d. good grades don't matter to me at all

10. How do you feel if you don't do as well in school as you know you can?

   a. feel very badly
   b. feel badly
   c. don't feel particularly badly
   d. doesn't bother me at all

TABLE 3

Multiple Regression: GPA with BSCA Subscales

Dependent Variable: GPA

Model	Variable Entered	B Value	F-Value	Sig. Level	R-Square
T_2	T_2	2.738	32.33	.0001	0.19556
T_1T_2	T_1				0.20720

NOTE: Because T_2 is the only significant regression coefficient, the values for T_1 are not given.

Multiple Regression: Language Arts (CTBS) with BSCA Subscales

Dependent Variable: Language Arts (CTBS)

Model	Variable Entered	B Value	F-Value	Sig. Level	R-Square
T_3	T_3	-42.495	27.34	.0001	0.16564
T_2T_3	T_2	22.020	5.70	.0174	0.20017
$T_1T_2T_3$	T_1				0.20999

NOTE: Because T_2 and T_3 are the only significant regression coefficients, the values for T_1 are not given.

Multiple Regression: Non-Verbal (CTBS) with BSCA Subscales

Dependent Variable: Non-Verbal (CTBS)

Model	Variable Entered	B Value	F-Value	Sig. Level	R-Square
T_2	T_2	12.259	33.62	.0001	0.20177

Multiple Regression: IQ with BSCA Subscales

Dependent Variable: IQ

Model	Variable Entered	B Value	F-Value	Sig. Level	R-Square
T_3	T_3	-22.0839	15.03	.0004	0.09512
T_2T_3	T_2	30.8171	7.39	.0075	0.14189
$T_1T_2T_3$	T_1	- 8.6624	4.54	.0328	0.17063

TABLE 4

Multiple Regression: GPA with BSCA Subscales
(IQ, Race, Sex held constant)

Model	Variable Entered	B Value	F-Value	Sig. Level	R-Square
IQ, R, S	IQ	0.169	86.18	.0001	0.40465
	R	0.244	1.38	ns	
	S	2.223	18.81	.0001	
IQ, R, S, T_1	T_1	0.829	29.49	.0001	0.51684

Multiple Regression: Language Arts (CTBS) with BSCA Subscales
(IQ, Race, Sex held constant)

Model	Variable Entered	B Value	F Value	Sig. Level	R-Square
IQ, R, S	IQ	1.083	168.48	.0001	0.56415
	R	3.216	2.09	ns	
	S	2.680	1.66	ns	
IQ, R, S, T_1	T_1	1.536	6.07	.0144	0.58402

Multiple Regression: Non-Verbal (CTBS) with BSCA Subscales
(IQ, Race, Sex held constant)

Model	Variable Entered	B Value	F-Value	Sig. Level	R-Square
IQ, R, S	IQ	0.699	120.89	.0001	0.45177
	R	-5.927	1.08	ns	
	S	1.194	0.06	ns	
IQ, R, S, T_2	T_2	8.447	21.10	.0001	o.52987

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